QUANTITATIVE METHODS (INC. MODELING & SIMULATION)

Assignment 1

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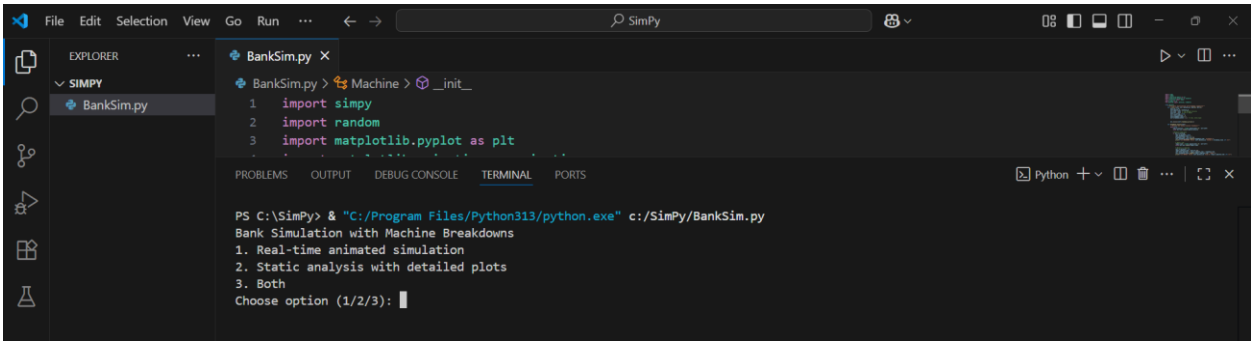
Simulation Tool:

- Visual Studio Code
- Python + SimPy
- Matplotlib (For Animation)

Simulation Project: Bank Simulation

The simulation imitates a bank queue simulation. It simulates the random arrival time of customers, bank tellers with conditions if the machines are broken or fixed, customer service process, queue management and statistics collection. The simulation also includes a line graph for visualization.

Simulation Sample Output:



Before the simulation begin, the user can choose if he/she only wants a real time animated simulation, static analysis with detailed plots or both.

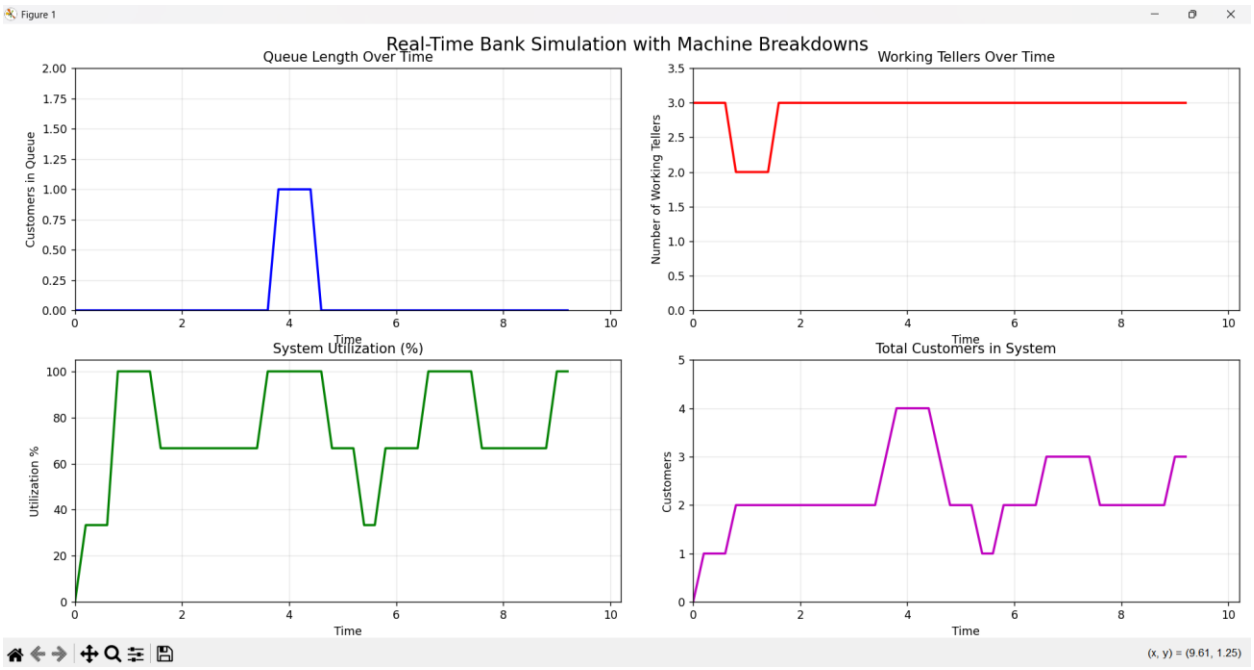


Figure 1
Real-Time Bank Simulation with Machine Breakdowns
Queue Length Over Time
Customers in Queue
Time
Working Tellers Over Time
Number of Working Tellers
Time
System Utilization (%)
Utilization %
Time
Total Customers in System
Customers
Time
(x, y) = (9.61, 1.25)

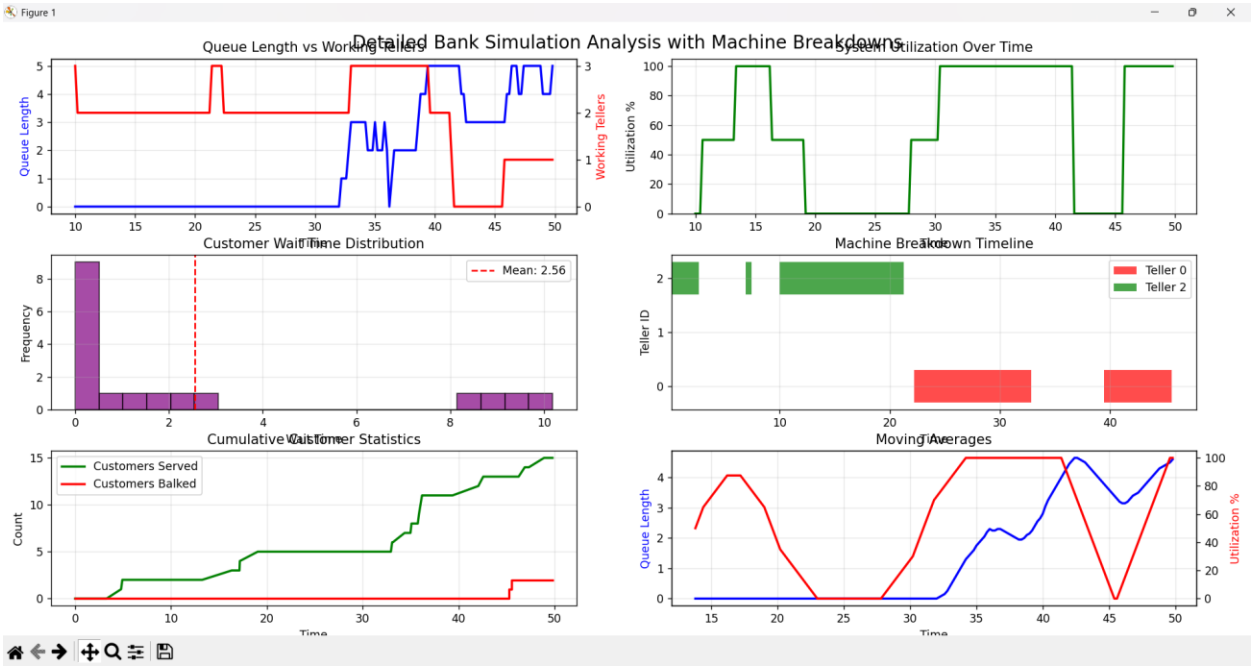
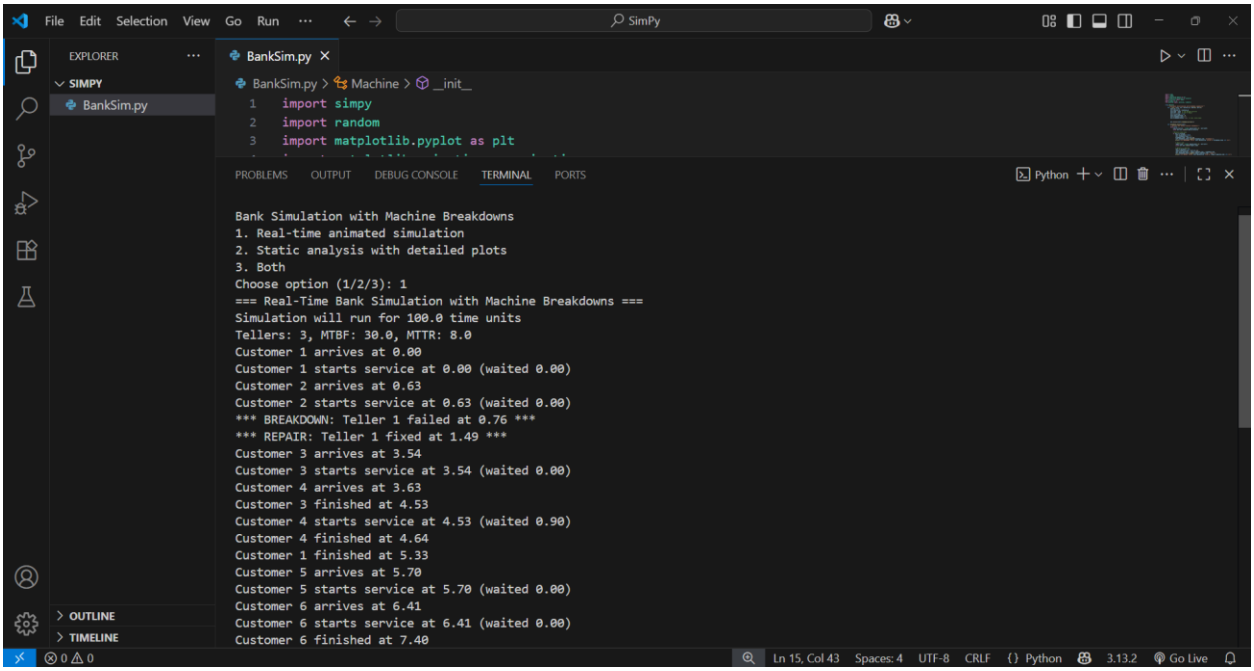


Figure 1
Detailed Bank Simulation Analysis with Machine Breakdowns
Queue Length vs Working Tellers
Queue Length
Working Tellers
System Utilization Over Time
Utilization %
Customer Wait Time Distribution
Mean: 2.56
Frequency
Machine Breakdown Timeline
Teller 0
Teller 2
Teller ID
Cumulative Customer Statistics
Customers Served
Customers Balked
Count
Moving Averages
Queue Length
Utilization %



Real-time bank simulation with visualization and output in the terminal. It shows the arrival time of the customer, waiting time, time of transaction, and the time when the transaction is finished. The simulation also includes the breakdown and repair time of the machine.

Virtualization Sample Recording:
https://drive.google.com/file/d/1AW9L5NnAdTkSS08B_yaVzj2mPx3jkiup/view?usp=sharing